

**Program Announcement
To DOE National Laboratories
LAB 04-14**

***Program for Ecosystem Research:
Scaling Across Levels of Biological Organization in Ecological
Systems***

SUMMARY: The Office of Biological and Environmental Research (BER) of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces its interest in receiving proposals for the Scaling Across Levels of Biological Organization in Ecological Systems Initiative, a component of the BER Program for Ecosystem Research (PER). Proposals should describe research projects to determine the theoretical and empirical bases of whether, and how, *information obtainable at the level of genomes and proteomes of species or communities can be used to explain, and predict, effects of environmental changes associated with energy production on the structure and functioning of important ecosystems*. The focus of proposals should be to: (1) demonstrate a capability to collect genomic, proteomic, and/or metabolomic data from within a terrestrial ecosystem and then use that data to explain and/or predict observed effects of controlled manipulations of temperature, soil moisture, atmospheric carbon dioxide concentration, and/or atmospheric ozone concentration on the structure and functioning of the ecosystem, or (2) advance the theoretical basis for scaling genomic and proteomic information to higher levels of biological organization, ultimately to the level of whole ecosystems.

All proposals submitted in response to this Program Announcement must explicitly state how the proposed research will support accomplishment of the BER Long Term Measure of Scientific Advancement to deliver improved data and models to determine acceptable levels of greenhouse gases in the atmosphere.

DATES: Researchers are encouraged (but not required) to submit a 1-2 page preproposal for programmatic review. There is no deadline for the preproposal, but early submission of preproposals is encouraged to allow time for meaningful discussions.

Formal proposals submitted in response to this Program Announcement must be received by 4:30 p.m., Eastern Time, April 29, 2004, to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2004.

ADDRESSES: Preproposals referencing Program Announcement LAB 04-14 should be sent to Dr. Jeffrey S. Amthor, PER program manager, via e-mail to jeff.amthor@science.doe.gov. Please include "Preproposal Program Announcement LAB 04-14" in the e-mail subject field.

Formal proposals in response to Program Announcement LAB 04-14 are to be submitted as 2 paper copies of the proposal and one CD containing the proposal in PDF format. Color images should be submitted as a separate file in PDF format and identified as such. These images should

be kept to a minimum due to the limitations of reproducing hardcopies. They should be numbered and referred to in the body of the technical scientific proposal as Color image 1, Color image 2, etc.

The 2 copies of the proposal and the CD, referencing Program Announcement LAB 04-14, should be sent to: Climate Change Research Division, SC-74/Germantown Building, Office of Biological and Environmental Research, Office of Science, U.S. Department of Energy, 1000 Independence Avenue, SW, Washington, D.C. 20585-1290, ATTN: Program Announcement LAB 04-14.

When submitting by U.S. Postal Service Express Mail, any commercial mail delivery service, or when hand carried by the researcher, the following address must be used: Climate Change Research Division, SC-74, Office of Biological and Environmental Research, Office of Science, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874-1290, ATTN: Program Announcement LAB 04-14.

FOR FURTHER INFORMATION CONTACT: Dr. Jeffrey S. Amthor, phone: (301) 903-2507; e-mail: jeff.amthor@science.doe.gov.

SUPPLEMENTARY INFORMATION:

Background: Program for Ecosystem Research (PER) and the Scaling Initiative

The PER mission is to measurably improve the scientific basis for predicting or detecting effects of environmental changes associated with energy production (i.e., global and regional changes in atmospheric composition and related climatic changes) on terrestrial ecosystems and their component organisms and processes. Terrestrial ecosystems, their functions, and their components most valued by society are of highest priority to the PER. The PER mission supports the DOE Energy Strategic Goal "to protect our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy" by contributing to the science base needed to judge environmental implications of various energy supply options.

The PER is intended to contribute specifically to the long-term BER program goal of delivering data and models needed to determine acceptable levels of greenhouse gases in the atmosphere. The PER's contribution to this goal is carried out by quantifying cause-and-effect relationships between environmental changes associated with energy production (i.e., increased concentrations of greenhouse gases in the atmosphere and related environmental changes) and the structure and functioning of important terrestrial ecosystems. Understanding of such relationships is important to a determination of acceptable levels of greenhouse gases.

The theme defining PER objectives is mechanistic understanding and quantification of effects of ongoing and potential future environmental changes associated with energy production on whole ecosystems. *Present program emphasis is on effects of multiple (concurrent) environmental changes, i.e., effects on ecosystems of combinations of changes in atmospheric composition and/or climatic variables.* Environmental changes of key interest to the PER are: (1) warming and changes in diurnal, seasonal, and interannual temperature cycles; (2) changes in precipitation

and evapotranspiration (e.g., intensification of the hydrologic cycle); and (3) increasing atmospheric carbon dioxide and (tropospheric) ozone concentrations. Specific PER objectives are to improve scientific understanding of how and why (or if) terrestrial ecosystems and their component organisms are affected by, and respond to, multiple environmental changes, and how and why critical biological and/or ecological processes in terrestrial ecosystems are controlled or modified by multiple environmental changes.

The PER supports experimental research, (in the laboratory or field as appropriate to individual research project objectives), and modeling at both universities and government laboratories. The research and modeling considers both, (either) direct and indirect effects of environmental changes on terrestrial ecosystems, their components, their processes, and their structures. Experimental research based on underlying theory, and modeling that considers ecological hierarchies (i.e., multi-level or mechanistic modeling), are foci of the PER. Ecosystem responses to environmental changes of particular interest include: (1) adjustments at the ecosystem scale, such as changes in the organized hierarchy of ecosystem processes, structures, biological diversity, and/or succession; and (2) adjustments at the organismal scale *that are manifested at the ecosystem scale*, including physiological, biochemical, and/or genetic changes that may facilitate (or hinder) ecosystem homeostasis.

The goal of the new Scaling Across Levels of Biological Organization in Ecological Systems Initiative is to determine the theoretical and empirical bases of whether, and how, *information obtainable at the level of genomes and proteomes of species or communities can be used to explain, and predict, effects of environmental changes associated with energy production on the structure and functioning of important ecosystems*. This is a new emphasis within PER and is intended to explicitly link ecosystem research and modeling with the rapidly advancing capabilities being developed in genomics, proteomics, and metabolomics.

Request for Proposals

This Program Announcement requests proposals for activities in support of the goal of the Scaling Initiative as articulated above. Specifically, research is sought to advance the following two areas:

(1) the uses of genomic, proteomic, and/or metabolomic measurements and analyses to explain and/or predict effects of controlled changes in temperature, soil moisture, atmospheric carbon dioxide concentration, and/or atmospheric ozone concentration on the structure and functioning of ecosystems, or

(2) the theoretical and/or computational bases for scaling information from the level of genomes, proteomes, and/or metabolomes to higher levels of biological organization, ultimately to the level of whole ecosystems.

Proposals involving empirical studies (area (1) above) should consider the use of existing manipulative field experiments as platforms for research. (Requests for support for implementation or maintenance of field manipulations of temperature, soil moisture, atmospheric carbon dioxide concentration, and/or atmospheric ozone concentration will not be considered.

Moreover, studies using natural gradients of environmental factors, rather than controlled manipulations, will not be considered.) In particular, proposals should propose to use existing field experiments to obtain new genomic, proteomic, and/or metabolomic data and use that data and, if appropriate, hierarchical theory of biological and ecological systems to: (1) explain (previously) observed effects of the manipulation(s) of temperature, soil moisture, atmospheric carbon dioxide concentration, and/or atmospheric ozone concentration on ecosystem-scale processes and states (ecosystem structure and functioning); and/or (2) make predictions based on theoretical models about changes in ecosystem structure and/or functioning that can and will be tested with observations and data at multiple scales within the range from the genome of individual species to the entire ecosystem. Performance of the ecosystem-scale observations and data analysis can be made a component of the proposed research. A few laboratory (i.e., mesocosm or microcosm) projects might be considered for funding, but it will be critical for such projects to represent well the processes, structures, and functioning of intact (actual) terrestrial ecosystems. Experimental control of the same environmental variables (ozone concentration, carbon dioxide concentration, soil moisture, and/or temperature) would need to be included in laboratory projects.

Proposals involving theoretical and modeling studies (area (2) above) should concentrate on developing new theoretical models or approaches to biological and ecological modeling. Such studies should incorporate genomic, proteomic, and/or metabolomic data, along with information on the associated biochemical and physiological mechanisms and pathways that control and influence biological and ecological processes, into hierarchical (multi-level) ecosystem models. The new models or modeling approaches should enhance a capability to explain and predict effects of environmental changes associated with energy production on ecosystem structure and functioning. The use of existing biological or ecological models to study or simulate biological or ecological effects of environmental change, without clearly articulated plans to improve the theoretical bases of scaling across multiple levels of biological organization within such models, will not be considered for support.

The focus of all proposals should be on the advancement of the theoretical and empirical bases for scaling information and data from the genomic, proteomic, and metabolomic level of component species and communities up through higher levels of biological organization within ecosystems to explain the causal mechanisms and pathways that determine whether and how effects of energy-related environmental changes are manifested on the structure and functioning of an ecosystem.

All proposals submitted in response to this Program Announcement must explicitly state how the proposed research will support accomplishment of the BER Long Term Measure of Scientific Advancement to deliver improved data and models to determine acceptable levels of greenhouse gases in the atmosphere. Proposals failing to fulfill this criterion will not be considered for funding.

Proposals focusing primarily on plant or ecosystem carbon exchange or carbon balance, or directed at carbon sequestration in terrestrial ecosystems, are inappropriate for PER. Such proposals should be directed to the DOE BER Terrestrial Carbon Processes (TCP) and Carbon Sequestration programs, respectively.

To enhance potential collaboration and synergism within the Scaling Initiative and the larger PER, successful researchers will participate in annual Investigator Meetings. Costs for such meetings should be included in each proposal budget, and should be based on one trip of 5 days each year to Washington, DC, for all key personnel of each project.

Program Funding

It is anticipated that about \$2,400,000 will be available for multiple awards in Fiscal Year 2004. Proposals may request project support for up to 3 years, with out-year support contingent on availability of funds, progress of the research, and programmatic needs. Annual budgets are expected to range from \$100,000 to \$500,000 total costs, unless there is prior approval from the Program Manager. DOE may encourage collaboration among prospective investigators to promote joint proposals by using information obtained in the preproposal or other forms of communication. DOE is under no obligation to pay for any costs associated with preparation or submission of proposals.

Preproposals

A preproposal is strongly encouraged (but not required) prior to submission of a full proposal. The preproposal should list the Principal Investigator's name, institution, address, telephone number, and E-mail address; title of the project; and proposed collaborators. The preproposal should consist of a one to two page narrative describing the research project objectives and methods of accomplishment. These will be reviewed relative to the goals of the Scaling Across Levels of Biological Organization in Ecological Systems Initiative. A response to each preproposal, discussing the potential program relevance of a formal proposal, generally will be communicated within 15 days of receipt. There is no deadline for the submission of preproposals, but researchers should allow sufficient time to meet the proposal deadline of April 29, 2004. Please note that notification of a successful preproposal is not an indication that an award will be made in response to the formal proposal.

Submission Information

In addition, for this Program Announcement, the research description must be 20 pages or less (10-point or larger font), including figures and tables but excluding attachments, and must include a one-page summary of the proposed project. The summary should appear on a separate page (page 1) and must include the proposed-project title; name of the researchers and the researcher's address, phone number, and e-mail address; names of any co-investigators; and the proposed-project summary. Attachments should include literature references cited in the research description, curriculum vitae for each investigator (2-page maximum per investigator), a listing of all current and pending federal support for each investigator, and letters of intent when collaborations are part of the proposed research.

The instructions and format described below should be followed. Reference Program Announcement LAB 04-14 on all submissions and inquiries about this program.

OFFICE OF SCIENCE
GUIDE FOR PREPARATION OF SCIENTIFIC/TECHNICAL PROPOSALS
TO BE SUBMITTED BY NATIONAL LABORATORIES

Proposals from National Laboratories submitted to the Office of Science (SC) as a result of this program announcement will follow the Department of Energy Field Work Proposal process with additional information requested to allow for scientific/technical merit review. The following guidelines for content and format are intended to facilitate an understanding of the requirements necessary for SC to conduct a merit review of a proposal. Please follow the guidelines carefully, as deviations could be cause for declination of a proposal without merit review.

1. Evaluation Criteria

Proposals will be subjected to formal merit review (peer review) and will be evaluated against the following criteria which are listed in descending order of importance:

Scientific and/or technical merit of the project

Appropriateness of the proposed method or approach

Competency of the personnel and adequacy of the proposed resources

Reasonableness and appropriateness of the proposed budget

The evaluation will include program policy factors such as the relevance of the proposed research to the terms of the announcement, the uniqueness of the proposer's capabilities, and demonstrated usefulness of the research for proposals in other DOE Program Offices as evidenced by a history of programmatic support directly related to the proposed work.

2. Summary of Proposal Contents

Field Work Proposal (FWP) Format (Reference DOE Order 5700.7C) (DOE ONLY)

Proposal Cover Page

Table of Contents

Abstract

Narrative

Literature Cited

Budget and Budget Explanation

Other support of investigators

Biographical Sketches

Description of facilities and resources

Appendix

2.1 Number of Copies to Submit

Formal proposals in response to Program Announcement LAB 04-14 are to be submitted as 2 paper copies of the proposal and one CD containing the proposal in PDF format. Color images

should be submitted as a separate file in PDF format and identified as such. These images should be kept to a minimum due to the limitations of reproducing hardcopies. They should be numbered and referred to in the body of the technical scientific proposal as Color image 1, Color image 2, etc.

3. Detailed Contents of the Proposal

Proposals must be readily legible, when photocopied, and must conform to the following three requirements: the height of the letters must be no smaller than 10 point with at least 2 points of spacing between lines (leading); the type density must average no more than 17 characters per inch; the margins must be at least one-half inch on all sides. Figures, charts, tables, figure legends, etc., may include type smaller than these requirements so long as they are still fully legible.

3.1 Field Work Proposal Format (Reference DOE Order 5700.7C) (DOE ONLY)

The Field Work Proposal (FWP) is to be prepared and submitted consistent with policies of the investigator's laboratory and the local DOE Operations Office. Additional information is also requested to allow for scientific/technical merit review.

Laboratories may submit proposals directly to the SC Program office listed above. A copy should also be provided to the appropriate DOE operations office.

3.2 Proposal Cover Page

The following proposal cover page information may be placed on plain paper. No form is required.

Title of proposed project
SC Program announcement title
Name of laboratory
Name of principal investigator (PI)
Position title of PI
Mailing address of PI
Telephone of PI
Fax number of PI
Electronic mail address of PI
Name of official signing for laboratory*
Title of official
Fax number of official
Telephone of official
Electronic mail address of official
Requested funding for each year; total request
Use of human subjects in proposed project:
 If activities involving human subjects are not planned at any time during the proposed project period, state "No"; otherwise state "Yes", provide the IRB

Approval date and Assurance of Compliance Number and include all necessary information with the proposal should human subjects be involved.

Use of vertebrate animals in proposed project:

If activities involving vertebrate animals are not planned at any time during this project, state "No"; otherwise state "Yes" and provide the IACUC Approval date and Animal Welfare Assurance number from NIH and include all necessary information with the proposal.

Signature of PI, date of signature

Signature of official, date of signature*

*The signature certifies that personnel and facilities are available as stated in the proposal, if the project is funded.

3.3 Table of Contents

Provide the initial page number for each of the sections of the proposal. Number pages consecutively at the bottom of each page throughout the proposal. Start each major section at the top of a new page. Do not use unnumbered pages and do not use suffices, such as 5a, 5b.

3.4 Abstract

Provide an abstract of no more than 250 words. Give the broad, long-term objectives and what the specific research proposed is intended to accomplish. State the hypotheses to be tested. Indicate how the proposed research addresses the SC scientific/technical area specifically described in this announcement.

3.5 Narrative

The narrative comprises the research plan for the project and is limited to 5 pages per task. It should contain the following subsections:

Background and Significance: Briefly sketch the background leading to the present proposal, critically evaluate existing knowledge, and specifically identify the gaps which the project is intended to fill. State concisely the importance of the research described in the proposal. Explain the relevance of the project to the research needs identified by the Office of Science. Include references to relevant published literature, both to work of the investigators and to work done by other researchers.

Preliminary Studies: Use this section to provide an account of any preliminary studies that may be pertinent to the proposal. Include any other information that will help to establish the experience and competence of the investigators to pursue the proposed project. References to appropriate publications and manuscripts submitted or accepted for publication may be included.

Research Design and Methods: Describe the research design and the procedures to be used to accomplish the specific aims of the project. Describe new techniques and methodologies and

explain the advantages over existing techniques and methodologies. As part of this section, provide a tentative sequence or timetable for the project.

Subcontract or Consortium Arrangements: If any portion of the project described under "Research Design and Methods" is to be done in collaboration with another institution, provide information on the institution and why it is to do the specific component of the project. Further information on any such arrangements is to be given in the sections "Budget and Budget Explanation", "Biographical Sketches", and "Description of Facilities and Resources".

3.6 Literature Cited

List all references cited in the narrative. Limit citations to current literature relevant to the proposed research. Information about each reference should be sufficient for it to be located by a reviewer of the proposal.

3.7 Budget and Budget Explanation

A detailed budget is required for the entire project period, which normally will be three years, and for each fiscal year. It is preferred that DOE's budget page, Form 4620.1 be used for providing budget information*. Modifications of categories are permissible to comply with institutional practices, for example with regard to overhead costs.

A written justification of each budget item is to follow the budget pages. For personnel this should take the form of a one-sentence statement of the role of the person in the project. Provide a detailed justification of the need for each item of permanent equipment. Explain each of the other direct costs in sufficient detail for reviewers to be able to judge the appropriateness of the amount requested.

Further instructions regarding the budget are given in section 4 of this guide.

* Form 4620.1 is available at web site: <http://www.sc.doe.gov/production/grants/Forms-E.html>

3.8 Other Support of Investigators

Other support is defined as all financial resources, whether Federal, non-Federal, commercial or institutional, available in direct support of an individual's research endeavors. Information on active and pending other support is required for all senior personnel, including investigators at collaborating institutions to be funded by a subcontract. For each item of other support, give the organization or agency, inclusive dates of the project or proposed project, annual funding, and level of effort devoted to the project.

3.9 Biographical Sketches

This information is required for senior personnel at the laboratory submitting the proposal and at all subcontracting institutions. The biographical sketch is limited to a maximum of two pages for each investigator.

3.10 Description of Facilities and Resources

Describe briefly the facilities to be used for the conduct of the proposed research. Indicate the performance sites and describe pertinent capabilities, including support facilities (such as machine shops) that will be used during the project. List the most important equipment items already available for the project and their pertinent capabilities. Include this information for each subcontracting institution, if any.

3.11 Appendix

Include collated sets of all appendix materials with each copy of the proposal. Do not use the appendix to circumvent the page limitations of the proposal. Information should be included that may not be easily accessible to a reviewer.

Reviewers are not required to consider information in the Appendix, only that in the body of the proposal. Reviewers may not have time to read extensive appendix materials with the same care as they will read the proposal proper.

The appendix may contain the following items: up to five publications, manuscripts (accepted for publication), abstracts, patents, or other printed materials directly relevant to this project, but not generally available to the scientific community; and letters from investigators at other institutions stating their agreement to participate in the project (do not include letters of endorsement of the project).

4. Detailed Instructions for the Budget

(DOE Form 4620.1 "Budget Page" may be used)

4.1 Salaries and Wages

List the names of the principal investigator and other key personnel and the estimated number of person-months for which DOE funding is requested. Proposers should list the number of postdoctoral associates and other professional positions included in the proposal and indicate the number of full-time-equivalent (FTE) person-months and rate of pay (hourly, monthly or annually). For graduate and undergraduate students and all other personnel categories such as secretarial, clerical, technical, etc., show the total number of people needed in each job title and total salaries needed. Salaries requested must be consistent with the institution's regular practices. The budget explanation should define concisely the role of each position in the overall project.

4.2 Equipment

DOE defines equipment as "an item of tangible personal property that has a useful life of more than two years and an acquisition cost of \$25,000 or more." Special purpose equipment means equipment which is used only for research, scientific or other technical activities. Items of needed equipment should be individually listed by description and estimated cost, including tax, and adequately justified. Allowable items ordinarily will be limited to scientific equipment that is

not already available for the conduct of the work. General purpose office equipment normally will not be considered eligible for support.

4.3 Domestic Travel

The type and extent of travel and its relation to the research should be specified. Funds may be requested for attendance at meetings and conferences, other travel associated with the work and subsistence. In order to qualify for support, attendance at meetings or conferences must enhance the investigator's capability to perform the research, plan extensions of it, or disseminate its results. Consultant's travel costs also may be requested.

4.4 Foreign Travel

Foreign travel is any travel outside Canada and the United States and its territories and possessions. Foreign travel may be approved only if it is directly related to project objectives.

4.5 Other Direct Costs

The budget should itemize other anticipated direct costs not included under the headings above, including materials and supplies, publication costs, computer services, and consultant services (which are discussed below). Other examples are: aircraft rental, space rental at research establishments away from the institution, minor building alterations, service charges, and fabrication of equipment or systems not available off- the-shelf. Reference books and periodicals may be charged to the project only if they are specifically related to the research.

a. Materials and Supplies

The budget should indicate in general terms the type of required expendable materials and supplies with their estimated costs. The breakdown should be more detailed when the cost is substantial.

b. Publication Costs/Page Charges

The budget may request funds for the costs of preparing and publishing the results of research, including costs of reports, reprints page charges, or other journal costs (except costs for prior or early publication), and necessary illustrations.

c. Consultant Services

Anticipated consultant services should be justified and information furnished on each individual's expertise, primary organizational affiliation, daily compensation rate and number of days expected service. Consultant's travel costs should be listed separately under travel in the budget.

d. Computer Services

The cost of computer services, including computer-based retrieval of scientific and technical information, may be requested. A justification based on the established computer service rates should be included.

e. Subcontracts

Subcontracts should be listed so that they can be properly evaluated. There should be an anticipated cost and an explanation of that cost for each subcontract. The total amount of each subcontract should also appear as a budget item.

4.6 Indirect Costs

Explain the basis for each overhead and indirect cost. Include the current rates.